

Claims

1. A method of multicasting data from a sender to first, second and third receivers through a network including first and second routers, the method comprising:

5 transmitting a data packet from said sender to said first, second and third receivers;

detecting at said first, second and third receivers whether said data packet is properly received;

10 transmitting a first reception information signal from said first receiver to said first router by a first path;

transmitting a second reception information signal from said second receiver to said first router by a second path;

15 determining, at said first router, in dependence upon said first and second reception information signals, whether said first and second receivers require re-transmission of said data packet and, if so, transmitting information relating to said first and second reception information signals to said second router;

determining, at said second router, whether said third receiver requires re-transmission of said data packet and, if not, instructing said first router to re-transmit said data packet to said first and second receivers.

20 2. A method according to claim 1, further comprising transmitting a request for information relating to said data packet from said first router to an archive router.

3. A method according to claim 1, further comprising receiving at said first router information relating to said data packet.

25 4. A method according to claim 1, wherein the network comprises a plurality of sub-networks.

5. A method of multicasting data from a sender to first, second, third and fourth receivers through a network including first and second routers, the method comprising:

transmitting first and second data packet from said sender to said first,

second, third and fourth receivers;

detecting at said first, second, third and fourth receivers whether said first and second data packets are properly received;

5 transmitting a first reception information signal from said first receiver to said first router by a first path;

transmitting a second reception information signal from said second receiver to said first router by a second path;

transmitting a third reception information signal from said third receiver to said first router by a third path;

10 determining, at said first router, in dependence upon said first, second and third reception information signals, whether said first, second and third receivers require re-transmission of said first and second data packets and, if so, transmitting information relating to said first, second and third reception information signals to said second router;

15 determining, at said second router, whether said fourth receiver requires re-transmission of said first and second data packets and, if not, instructing said first router to re-transmit appropriate data packets to said first, second and third receivers.

6. A method according to claim 5, further comprising transmitting a request for
20 information relating to said data packet from said first router to an archive router.

7. A method according to claim 5, further comprising receiving at said first router information relating to said data packet.

8. A method according to claim 5, wherein the network comprises a plurality of sub-networks.

25 9. A method of operating a router, the method comprising:
receiving a first message comprising information relating to receipt of a data packet by a first receiver,
receiving a second message comprising information relating to receipt of a data packet by a second receiver,

determining in dependence upon said first and second messages whether said first and second receivers require re-transmission of said data packet and, if so, transmitting a third message relating to receipt of said data packet by said first and second receivers to another router and

5 receiving an instruction from said other router to retransmit said data packet to said first and second routers.

10. A method of operating a network element, the method comprising:

receiving a first message from a first network element comprising information relating to receipt of a data packet by a first receiver,

10 determining whether a second message from a second network element comprising information relating to receipt of said data packet by a second receiver has been received and

if not, instructing said first network element to re-transmit said data packet, or

15 if so, transmitting a third message relating to receipt of said data packet by said first and second receivers to third network element and receiving an instruction from said third network element to re-transmit said data packet to said first and second network elements.

11. A method of operating a network element, the method comprising:

20 receiving a first message from a first network element comprising a first set of information relating to a plurality of data packets,

determining whether a second message from a second network element comprising a second set of information relating to said plurality of data packets has been received and

25 if not, instructing said first network element to re-transmit one or more of said plurality of data packets in dependence upon said first set of information,

if so, in dependence upon said first and second sets of information, determining the number data packets common to both first and second sets that are required for re-transmission and determining whether this number exceeds a

30 predetermined number and

if the number does not exceed the predetermined number,

instructing said first network element to re-transmit one or more of said plurality of data packets in dependence upon said first set of information and instructing said second network element to re-transmit one or more of said plurality of data packets in dependence upon said second set of information,

if the number does exceed the predetermined number,
transmitting a third message relating to said first and second sets of information to third network element and receiving an instruction from said third network element to re-transmit one or more of said plurality of data packets in dependence upon said first and second sets of information.

12. A method of recovery of a data packet in a network including first and second routers, the method comprising:

receiving at the first router, via a first path, first reception information relating to said data packet including information relating to the identity of the source of said first reception information;

receiving at the first router, via a second path, second reception information relating to said data packet including information relating to the identity of the source of said second reception information;

determining, at said first router, in dependence upon said first and second reception information signals, whether recovery of said data packet is required and, if so, transmitting information relating to said first and second reception information signals to said second router; and

determining at said second router, whether further reception state information relating to said data packet identifying a further source is received and whether recovery of said data packet in respect of said further source is required and, if not, instructing said first router to transmit said data packet for intended receipt by said sources of said first and second reception information.

13. A method according claim 12, wherein the network comprises a plurality of sub-networks.

14. A system for multicasting data from a sender to first, second and third receivers through a network including first and second routers, comprising:

a first router including:

an input to receive a first reception information signal relating to whether said data packet is properly received by said first receiver and a second reception information signal relating to whether said data packet is properly received by said second receiver;

a processor to determine in dependence upon said first and second reception information signals, whether said first and second receivers require re-transmission of said data packet and

an output to transmit information relating to said first and second detection information signals to said second router;

a second router including:

an input to receive said information from the first router and a third reception information signal relating to whether said data packet is properly received by said third receiver

a processor to determine whether said third receiver requires re-transmission of said data packet and

an output to transmit an instruction to said first router to re-transmit said data packet to said first and second receivers.

15. A system for multicasting data from a sender to first, second and third receivers through a plurality of networks including first and second routers, comprising:

a first router including:

an input to receive a first reception information signal relating to whether said data packet is properly received by said first receiver and a second reception information signal relating to whether said data packet is properly received by said second receiver;

a processor to determine in dependence upon said first and second reception information signals, whether said first and second receivers require re-transmission of said data packet and

an output to transmit information relating to said first and second detection information signals to said second router;

a second router including:

an input to receive said information from the first router and a third reception information signal relating to whether said data packet is properly received by said third receiver

a processor to determine whether said third receiver requires re-
5 transmission of said data packet and

an output to transmit an instruction to said first router to re-transmit said data packet to said first and second receivers.

16. A router comprising:

an input for receiving a first message comprising information relating to
10 receipt of a data packet by a first receiver;

an input for receiving a second message comprising information relating to receipt of a data packet by a second receiver,

a processor for determining in dependence upon said first and second messages whether said first and second receivers require re-transmission of said data
15 packet and

an output for transmitting a third message relating to receipt of said data packet by said first and second receivers to another router if said first and second receivers require re-transmission of said data packet and

an input for receiving an instruction from said other router to retransmit said
20 data packet to said first and second receivers.

17. A computer program comprising computer code operable to make data processing apparatus:

receive a first message comprising information relating to receipt of a data packet by a first receiver;

25 receive a second message comprising information relating to receipt of a data packet by a second receiver,

determine in dependence upon said first and second messages whether said first and second receivers require retransmission of said data packet and

transmit a third message relating to receipt of said data packet by said first and
30 second receivers to a router if said first and second receivers require re-transmission of said data packet and

receive an instruction from said router to retransmit said data packet to said first and second receivers.

20010821 090101